

Econ 340: Introduction to Mathematical Economics

Fall, 2019
Enterprise Hall, Room 174
Thursday, 4:30pm to 7:10pm

Instructor:

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Office Hours: Thursday 2: 00 pm to 4: 00pm and by appointment

Description of the Course: This course is to help students understand the basic mathematical methods that become indispensable for economics analysis. Mathematics is a bitter medicine, necessary and inescapable, but tortuous. The course aims to make the application of mathematics more enjoyable and easy to understand. More than learning the basic calculus, the course focuses on the intuitions behind the math; why do we apply a certain mathematical tool? What is the economic implication of an equation? The course will go through a few mathematical models in economics, such as IS-LM model, the general equilibrium. Hope the course will help all students understand economics analysis better.

Learning Objective: This course will give you a good training on mathematical economics. Students are taught in some basic mathematical tools; (i) differentiation, (ii) optimization, (iii) application of the mathematical tools. With those mathematical knowledge, students will get a deeper understanding of economics.

Requirements: The requirements of this course are an in-class midterm exam, an in-class final exam, and a series of homework problem sets. I prefer each student spend at least 40 minutes to an hour on the homework sets. Finishing the homework is extremely helpful for the midterm and final exams.

Homework: For every two weeks, we will have a take home homework set to work on. The homework is distributed through Blackboard. The homework problem sets are due at the beginning of the class, if you turned in your homework late, you will get 70% of the grade. Please present your homework in papers.

Class notes: I will provide the class notes for each class. The class notes will be posted on Blackboard before each class. Class notes may give you examples and applications that are not in

the textbooks. Those notes can be considered as a complement to the textbook, and will be helpful to your study. If something from the notes is not clear, just ask me.

Grading: Your grade will be based on the following factors:

- 25% of your grade will be based on your score on the midterm;
- 30% of your grade will be based on your score on the final exam;
- 30% will be based on your score on homework;
- 10% will be based on your participation;
- 5% will be based on quizzes

Given the nature of the course, class participation is *mandatory*. The midterm exam will count 25%, and the final exam will count 30%. Class participation, will comprise 10% of the grade. The participation will be based on your attendance and in-class discussion. Homework problem set will comprise 30% of the grade. At the beginning of most classes, I will give a short quiz to test whether you did the assigned reading. These quizzes will comprise 5% of your grade.

For each of the above aspects I will give you a score between 0 and 100. I'll then compute the weighted average to give you a *final score*. In past years grades and final scores had approximately the following relationship.

| Final Score | Grade |
|-------------|-------|
| 92-100 | A+ |
| 88-92 | A |
| 85-87 | A- |
| 82-84 | B+ |
| 75-81 | B |
| 72-73 | B- |
| 70-71 | C+ |
| 63-69 | C |
| 60-62 | C- |
| 55-59 | D+ |
| 52-55 | D |
| 49-52 | D- |
| 0-49 | F |

GMU Blackboard: All the in class notes and homework are distributed through GMU's Blackboard. Please check the Blackboard before each class, and your GMU email for latest news for the class.

Academic Integrity: George Mason University has an Honor Code, which requires all members of this community to maintain the highest standards of academic honesty and integrity. Cheating, plagiarism, lying, and stealing are all prohibited. All violations of the Honor Code will be reported to the Honor Committee. See <http://www.gmu.edu/academics/catalog/9798/honorcod.html> for more detailed information.

Students with Disabilities: If you are a student with a disability and you need academic accommodations, please let me know and contact the Office of Disability Services (<http://ods.gmu.edu>) at 703-993-2474. All academic accommodations must be arranged through that office. Instructors should inform students that the need for accommodations should be identified at the beginning of the semester and that the specific accommodation has to be arranged through the Office of Disability Resources. Faculty should not provide accommodations to students on their own (e.g. allowing a student extra time to complete an exam because the student reports having a disability). If they are pressured by a student or parent to do so, they should contact the Office of Disability Resources.

Text Books:

SCHAUM's Introduction to Mathematical Economics 3rd edition (required)

Kevin Wainwright & Alpha C Chiang's *Fundamental Methods of Mathematical Economics* 4th Edition (recommended, 3rd edition works as well)

Tentative Schedule of Class Meetings

Week 1 (August 29th): Warm up and Preparation

- The Meaning of Using Mathematics in Economics
- Basic Reviews

Text book: Introduction to Mathematical Economics Chapter 1 and preview of Chapter 2

Week 1 note

Week 2 (Sep 5th): Linear and Quadratic Equations

- Supply and Demand Curve in Linear Equations
- Application of Graphics

Text book: Introduction to Mathematical Economics Chapter 2

Week 2 Note

Week 3 (Sep 12th): Exponential, and Logarithmic Function

- Example of Exponential and Logarithmic Function in Economics
- Applications

Text book: Introduction to Mathematical Economics Chapter 7

Week 3 Note

Week 4 (Sep 19): Static Equilibrium

- Finding the Equilibrium of Supply and Demand
- IS-LM
- General Equilibrium

Week 4 Note

Week 5 (Sep 26th): Derivatives

- Comparative Statics and Concept of Derivatives
- Differentiation and Comparative Statics

Text book: Introduction to Mathematical Economics Chapter 13

Week 5 Note

Week 6 (Oct 3rd): Differentiation & Review for Midterm

- Marginal Analysis in Microeconomics
- Reviews

Week 7 (Oct 10th) : Mid-term**Week 8 (Oct 17th) : Optimization**

- Local and Global extremum

Text book: Introduction to Mathematical Economics Chapter 5 and Chapter 6

Week 8 Note

Week 9 (Oct 24th): Optimization with constraints

- Lagrange equation

Week 9 Note

Week 10 (Oct 31th): Applying Integral Calculus

- Basic Rules and Examples of Integral
- Application of Integral

Text book: Introduction to Mathematical Economics Chapter 14 and Chapter 15

Week 10 Note

Week 11 (Nov 7th): Understanding Dynamics

- The concept of Dynamics
- Dynamics of Market Price

Week 11 Note

Week 12 (Nov 14th): First-Order Differential Equations

- First-Order Linear and Nonlinear Differential Equation
- Dynamics in macroeconomics
- Application: Solow Growth Model

Text book: Introduction to Mathematical Economics Chapter 16

Week 12 Note

Week 13 (Nov 21st): First-Order Difference Equations

- First-Order Linear Differential Equation

- First-Order Nonlinear Differential Equation

Text book: Introduction to Mathematical Economics Chapter 17

Week 13 Note

No class on Thanksgiving day, Nov 28th

Week 14 (Dec 5th): Second-Order Differential and Difference Equations, and Review

- Second-order Linear Differential Equation
- Second-order Nonlinear Differential Equation

Text book: Introduction to Mathematical Economics Chapter 18

Week 14 Note

Final Exam